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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Sam	Conte	Fort Wayne, IN
Jeff	Britton	Fort Wayne, IN

☐ *Additional inventors are being named on the ______ separately numbered sheets attached hereto*

17548 U.S. PTO 60/526733 120203

TITLE OF THE INVENTION (280 characters max)

USE OF ENGINEERED-WOOD MATERIAL IN FURNITURE

CORRESPONDENCE ADDRESS

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ENCLOSED APPLICATION PARTS ***(check all that apply)***

☒ Specification *Number of Page* 14

☒ Drawing(s) *Number of Sheets* 5

☒ Small Entity Statement

☒ Other (specify) ______

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

	FILING FEE AMOUNT ($)
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

Date: December 2, 2003

Jeffrey J. Krapp

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Registration No. 45,384

Docket No.: BRT-8

Telephone No.: 260-485-6001

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This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C., 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

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Re: Provisional Application for United States Letters Patent
APPLICANT: Sam Conte et al.
TITLE OF INVENTION: USE OF ENGINEERED-WOOD MATERIAL IN FURNITURE

Sir:

Forwarded herewith is the above-identified application, consisting of the following:

PTO/SB/16
Specification (14 Sheets)
Drawings (5 Sheets)
Applicant claims small entity status. See 37 CFR 1.27.

Respectfully submitted,

Jeffrey T. Knapp
Registration No. 45,384

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(Signature of Person Mailing Paper or Fee)

Sam Conte
Jeff Britton

USE OF ENGINEERED-WOOD MATERIALS IN FURNITURE

BACKGROUND OF THE INVENTION

1. Field of the invention.

The present invention relates to the use of engineered-wood materials in furniture and, more particularly, the use of such material as a spring material within furniture.

2. Description of the related art.

A goal in the furniture industry has been to produce furniture that is inexpensive to produce, yet durable in nature. In an attempt to produce such furniture, plastic material has been used, especially for the backing of seats. However, it has been found that plastic material is subject to age degradation, ozone cracking, and/or the continued application of stress. In fact, it has been shown that the application of large stresses to such plastic-backed seats over a continued period of time can cause the plastic to lose its spring quality and not return to its original shape.

Given the problems that have resulted in the use of plastics in furniture, there has been a desire to employ other materials in furniture that are generally inexpensive, yet more durable than plastics. One material whose use has been explored is oriented strand board (OSB). OSB is formed of molded shards of wood and resins. In such an instance, there is little to no orientation applied to the wood. As such, there is no defined

grain within such a strand board. Additionally, since the shards used in OSB generally are not very precisely shaped, nor are they oriented within the wood composites, there tends to be large variations in the properties throughout a given piece of such a composite, as well as in differing directions within such a composite. Such variations can include such characteristics as strength, spring factor or modulus of elasticity, and ease with which the surface area can be treated (e.g., stained, painted, and/or sanded, if needed).

Even with the obvious drawbacks associated with OSB, there are potential advantages associated with its use. One advantage is that a variety of shards of wood including forest floor products such as twigs, branches, chips, etc.; recycled wood; and/or other forms of wood can be used in making such a wood composite. Thus, the use of such engineered-wood composites is both environmentally friendly and economical in that it maximizes the use of a given tree. However, the random shard orientation found in OSB results in an omnidirectional material in which stress concentration can occur in any of a variety of places, making it more difficult to predict the life span of a product using OSB.

Another engineered-wood composite has been developed which offers a more promising future than OSB. This engineered-wood product is commonly referred to as strand wood. Strand wood was developed at Michigan Technological University. Such an engineered-wood material is described in U.S. Patent No.

4,241,133 (Lund et al.), the disclosure of which is hereby incorporated by reference. Strand wood represents an improvement over OSB in that strand board uses shards that are shaped and oriented more consistently than OSB, thereby creating a wood product with more precise and more defined behavior than was possible with OSB. In such a material, the shards of wood are oriented so as to be parallel to the thickness and length of the boards. By orienting shards, strand boards have a grain and a particular spring constant associated with a given direction. Another advantage gained by having such preferred orientation by the shards, this engineered material is stronger over its length and provides a more uniform behavior in a given direction.

Strand wood tends to employ a greater concentration of resin/binder than that used with OSB. As a result of this relatively high resin content, strand wood tends to exhibit less stress concentration around machined portions or holes or around flaws which may exist in the material. Furthermore, this high binder concentration affords strand woods to molding processes. In creating molded edges, stress concentrations which may otherwise exist at edges are minimized and/or eliminated by the resin which flows and seals around such edges and/or other stress concentrators.

What is needed in the art is the ability to employ engineered-wood material in furniture in a manner which takes advantage of the inexpensive nature of such engineered-wood material (generally two-thirds the price of plywood) and also

take advantage of the pliability/spring quality of such wood materials.

A particular problem exists in the construction of seat backs for sofas. In a typical sofa (Fig. 1) a system of springs is employed to provide the primary source of the cushiony yet supported seals of a sofa seat back. While the springs themselves may be relatively inexpensive, such a sofa system is quite labor intensive and involves extra expenses because of the nature of the springs being used.

One problem that exists is that for the springs to act as a support within the system, both ends of the springs must be connected to a portion of the sofa, one end being connected to the seat back and the other end connected to the base of the couch. Furthermore, to allow the springs to act together and to generally retain their placement in the couch or chair, these springs need to be further connected at a point intermediate of their length. Yet further, in order for the couch to have a sufficiently cushiony feel, a layer of batting generally needs to be provided in order to give a couch or sofa a sufficiently cushiony feel. Additionally, the foam portions used in covering such springs are generally molded or shaped so as the springs can not be counted on solely to provide a desired seat back shape for the couch.

As a result, a yet further goal for the present invention is to achieve a couch seat back that will eliminate the need to use

metal springs for the primary spring material in a seat back of a sofa.

SUMMARY OF THE INVENTION

The present invention is directed to the use of engineered-wood material in furniture in such a manner so as to take advantage of the precise spring and strength characteristics of this material.

An advantage of the present invention is that the engineered-wood material used is relatively inexpensive, approximately two-thirds of the cost of plywood. The wood source for such a material can be any of a variety of wood products including, but not necessarily limited to, forest floor remnants (e.g., twigs, branches, wood chips, etc.), recycled wood, and/or other wood material. The wood products used may include soft and/or hard wood materials. Furthermore, potentially a percentage of other material such as recycled plastic materials could be incorporated into such a engineered-wood material and still result in the desired characteristics.

Since forest floor remnants and recycled wood can be used for this product, engineered-wood materials are both environmentally friendly and economical.

Another advantage of the present invention is that the engineered-wood material tends to have a long life expectancy as the resin and various additives included therein tend to promote the age resistance of the materials.

Yet another advantage of the present invention is that the engineered-wood material is strong yet pliable (modulus elasticity of about 10^9 psi). This combination of strength and pliability lends itself to being an appropriate spring material for use in furniture, thereby providing a firm yet cushioned feel in a given piece of furniture.

An additional advantage of the present invention is that the grains of the engineered-wood materials lends itself to a uniformed behavior in (both for mechanical and esthetic qualities) in a given direction, similar to solid wood. In fact, this material can be expected to be more uniformly behaved as there are no knots and other blemishes generally associated with solid wood.

Yet another advantage of the present invention is that it is not susceptible to stress concentrators (holes, edges, flaws, etc.) due to the presence of the relatively high amounts of resin binders.

A further advantage of the present invention is that the engineered-wood material is both moldable and machinable.

Another advantage of the present invention is that the engineered-wood material can be used as a spring material in a variety of furniture applications including, but not limited to, chairs, seat backs, lumbar support, couches, and loveseats.

DETAILED DESCRIPTION OF THE INVENTION

A first embodiment of the present invention is illustrated in Figs. 2 and 3. In this embodiment, couch 20 includes a back

board 22, a base 24, a plurality of wood springs 26, a top foam spring 28, a lumbar foam spring 30, a foam sheet 32, and fabric 34.

Wood springs 26 are advantageously formed of an engineered-wood material such as strand wood having a definitive grain orientation. It is to be understood that any available engineered-wood material having a sufficiently defined spring quality in the manner as that presented in strand wood is considered sufficient for the purpose of the present invention and is considered within the scope thereof. In couch 20, the grain in wood springs 26 is aligned so as to run from top to bottom.

Wood springs 26 are molded so as to have a naturally arcuate shape and are mounted fixedly relative to base 24, but are allowed to float freely against top foam spring 28. By being mounted in such a fashion and by having sufficient pliability, the engineered-wood material of wood springs 26 is able to provide a sufficient spring quality so as to thereby allow these wood springs 26 to replace the metal springs that have been used in the prior art. The shape of wood springs 26 along with the inherent qualities of the engineered-wood material of which they are made together provide for a consistent spring concept which allows the couch 20 to have a consistent feel and cushion quality throughout and to retain its cushiony feel over time.

Further enhancing the spring quality of wood springs 26 is the presence of top foam spring 28. Top foam spring 28 is made

of a high density foam and is glued to back board 22. As such, top foam spring 28 prevents potentially damaging contact between any of wood springs 26 and back board 22 and provides a further spring element for an enhanced cushiony feel even when a user of couch 20 leans back towards back board 22. Although not shown, it would be advantageous for high density foam piece 28 to have a wear resistant layer formed on its face that is in constant contact with springs 26, thereby enhancing the expected life for this particular piece.

Advantageously located approximately one-third of the distance up from base 24 and interconnecting each of wood springs 26 is lumbar foam spring 30. Like the connection between top foam spring 28 and back board 22, lumbar foam spring 30 is advantageously connected to each of wood springs 26 by an adhesive or glue. Lumbar foam spring 30 offers the advantage of additional lumbar support for the back of a given user. Further, by being interconnected with the wood springs 26, lumbar foam spring 30 allows for the springs 26 to operate in unison more so than would be possible if no interconnection was provided therebetween. The type of foam ideally used for lumbar foam spring 30 is 2.5-3lb foam.

Foam sheet 32 is put in place over the combination of wood springs 26 and lumbar foam spring 30. Foam sheet 32 is formed from a flat sheet of foam. Such a foam sheet is relatively inexpensive and does not need to be preshaped or provided with a particular contour. Instead, in the course of mounting it in

place with fabric 34 over wood springs 26 and lumbar foam spring 30, foam sheet 32 takes the appropriate shape needed. Another advantage associated with such a foam sheet 32 is that it can be manufactured to any desired size and length and/or can be cut from a larger sheet of foam. The cushiony feel provided by the combination of foam sheet 32, lumbar foam spring 30, top foam spring 38, and wood springs 26 eliminates the need for batting to achieve the desired degree of softness. This is especially advantageous since the elimination of the need for batting between the foam slab and the fabric reduces the material and labor costs of constructing couch 20.

Although not shown as part of the embodiment of the couch shown in Figs. 2 and 3, it is to be understood that wood springs 26 could be formed so as to be integral with one another via a support strip along the low end thereof, thereby producing a comb-type shape. That strip, instead of the individual wood springs 26, could then be connected to wood base 24. One advantage of such a comb configuration is that it would reduce the number of connections needed to attach wood springs 26 and would promote a more uniform feel throughout couch 20.

Chair 40 shown in Figs. 4-6 represent the second embodiment of the present invention. Chair 40 includes a seat 42, a bracket 44, a backrest 46, lumbar foam 48, and main foam 50. Backrest 46 is of a unitary construction and includes a main back portion 52 and a lumbar support 54. Main back portion 52 and lumbar support 54 are separated by relief slots 56.

Bracket 44 acts as a means by which backrest 46 is attached to seat 42. Bracket 44 further offers a point at which backrest 46 can hinge or move in a cantilever action relative to seat 42.

Backrest 46 is mounted fixedly to bracket 44. Backrest 46 is molded so as to integrally include main back portion 52 and lumbar support 54. As best seen in Fig. 5, lumbar support 54 is molded so as to angle away from main back portion 52 and toward seat 42. By being integrally connected yet angled away from main back portion 52 in the manner shown, lumbar support 54 is able to act as a spring capable of providing additional lower back support. In fact, the spring qualities of lumbar support 54 can actually act as a massage element. By the user moving back and forth along seat 42, the lumbar support 54 is able to move in such a manner so as to actually massage the lower back or lumbar region.

Backrest 46 displays two modes of cantilever action. Main back portion 52 displays a main deflection D1 relative to bracket 44, while lumbar support 54 displays a lumbar deflection D2 relative to main back portion 52. To promote the flexibility thereof, backrest 46 is advantageously 3/8 to 5/8 inches thick, thereby offering both sufficient pliability and strength. The deflection of each of main back portion 52 and lumbar support 54 can be calculated using the same basic set of equations.

$$D = \frac{w\ell^2}{3EI}$$

Where D = deflection

W = 0.18 • (weight of user)

ℓ = length or height of member

E = elastic modulus of engineered-wood

I = moment of inertia

$$I = \frac{bh^3}{12}$$

Where b = member thickness

h = member height

As can be seen by looking at the variables, D1 and D2 will vary relative to one another based solely upon their effective length or height, as all other variables are the same for each. The potential total deflection of lumbar support 54 is determined by adding D1 and D2 together. Their effects are additive because main back portion 52 acts as a primary cantilever while lumbar support 54 acts as a secondary floating cantilever.

Lumbar foam 48 provides an additional spring quality to chair 40. The combined operation of lumbar support 54 and lumbar foam 48 provides chair 40 with ample lumbar support and comfort for a user therein.

A layer of main foam 50 and a further layer of fabric (not shown) are then provided on backrest 46 and lumbar foam 48 to complete the upper portion of chair 40. Given the support and comfort provided by the spring qualities associated with bracket

44 and backrest 46, a simple, non-molded piece of foam can be used for main foam 50.

In a third embodiment of the present invention, a finger backboard 60 (Figs. 7 and 8) is illustrated. Finger backboard 60 includes a common mount section 62 and a plurality of fingers 64. Further shown in an attachment of a foam cushion 66 to fingers 64. It is to be understood that the third embodiment can be incorporated with either of the previous described embodiments.

Finger backboard 60 may be formed via a molding process or by machining or in combination thereof. Slats 68 are formed between fingers 64 so as to allow a degree of independent movement between adjacent fingers. However, since fingers 64 are commonly mounted to mount section 62, there is some degree of interdependence in movement between adjacent fingers 64.

The presence of fingers 64 actually allow for turning movement to take place within the chair without having to move the seat thereof. Additionally, fingers 64 permit the finger backboard 60 to conform to the shape of the user, thereby promoting greater comfort for the user. Similar to the other embodiments, common mount section 62 and/or fingers 64 can be curved to promote greater lumbar support. A yet further advantage of finger backboard 60 is that there is the potential to make any length of finger backboard 60. This can potentially be accomplished by molding and/or machining to the desired size or by cutting finger backboard 60 to shape from a longer base backboard construct.

An additional advantage of finger backboard 60 is that, due to the total weight being supported by the number of fingers 64 associated with a given finger backboard 60, the total load and/or deflection experienced by a given finger backboard 60 will be divided over the number of fingers 64 supporting the weight. The following equations show the expected amount of deflection and shear stress that a given finger should experience. In each equation n = number of fingers.

$$\Delta Deflection(finger) = \frac{w\ell^2}{3EI} \div n$$

Sheer Stress $S_S(finger) = 3/2 \frac{(load)}{2bh} \div n$

Embodiment four, as shown in Figs. 9 and 10 is an extension of the second embodiment of the invention. Embodiment four is a fully cantilevered seat 70 including a dual-cantilever seat 72, a dual-cantilever back 74, a pair of brackets 76, and a fixed beam mount 78. Dual-cantilever seat 72 (with its grain front-to-back) and dual-cantilever back 74 (with its grain top-to-bottom) are constructed in much the same manner as in the seat back of chair 40, thereby providing an additional degree of spring comfort within seat 70. In addition to the cantilever action of seat 72 relative to fixed beam mount 78 and back 74 relative to brackets 76, brackets 76 also provide for a floating cantilever fulcrum. The arrangement of fully cantilevered seat 70 thereby provides

two dependent cantilever motions in series. Due to the cantilever nature of seat 70, it is possible to massage the lower back region by rocking in the chair.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

wood spring

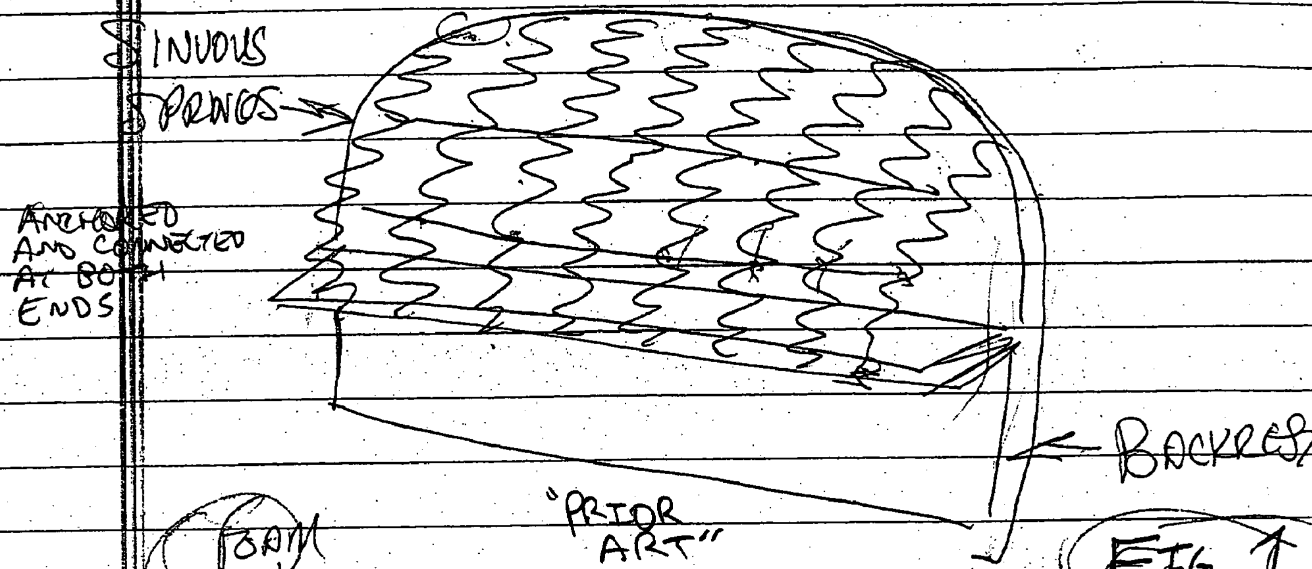
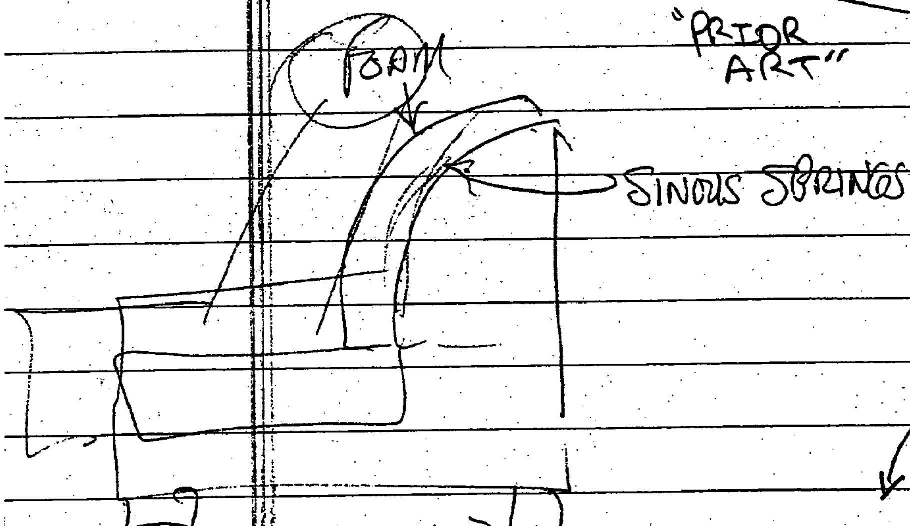


FIG. 1

PRIOR ART



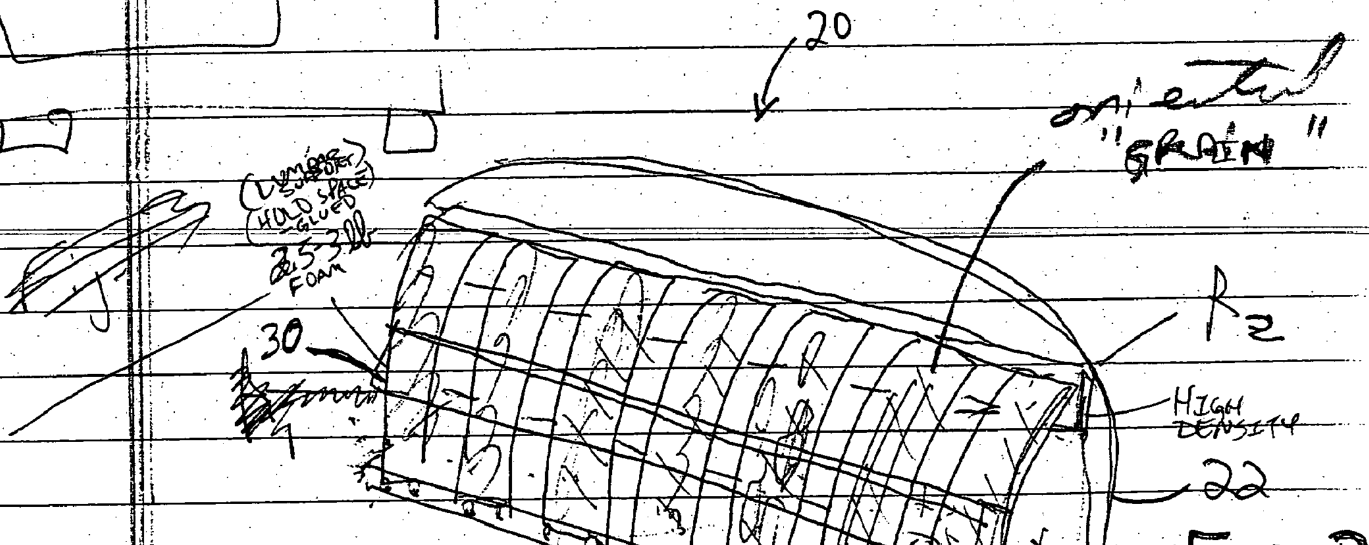


FIG. 2

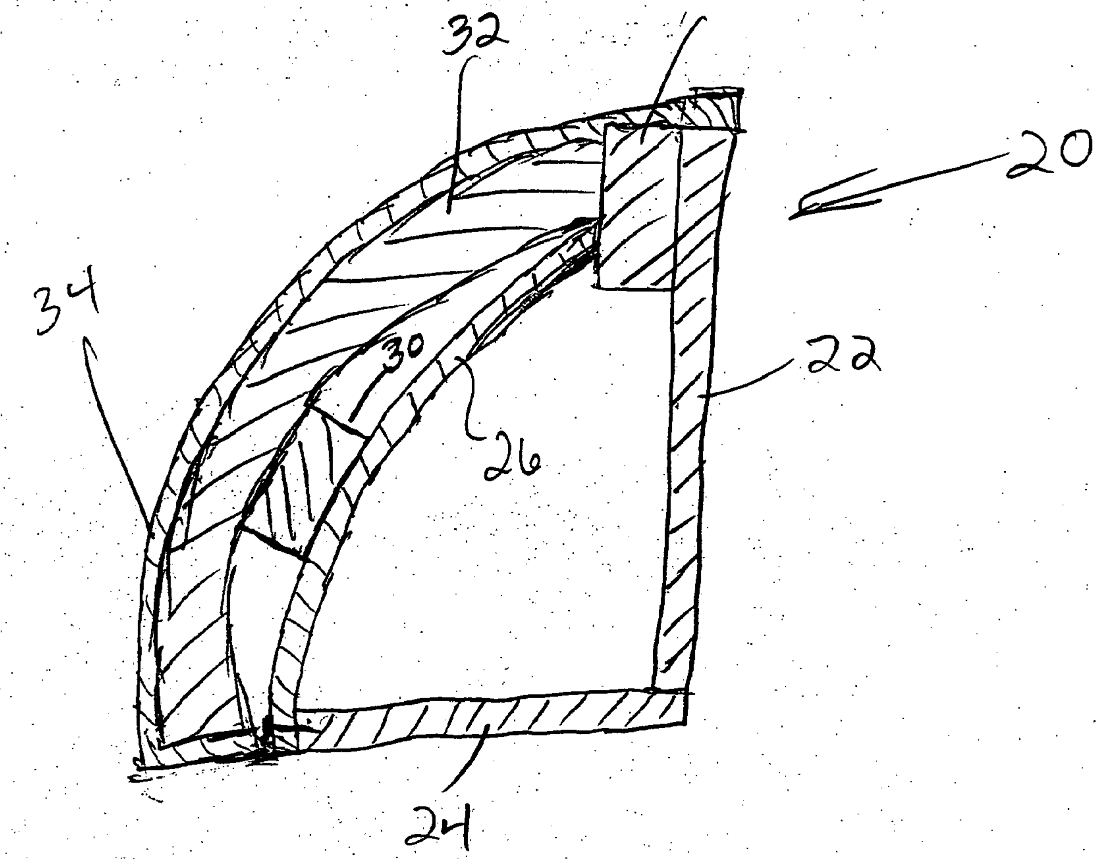


FIG. 3

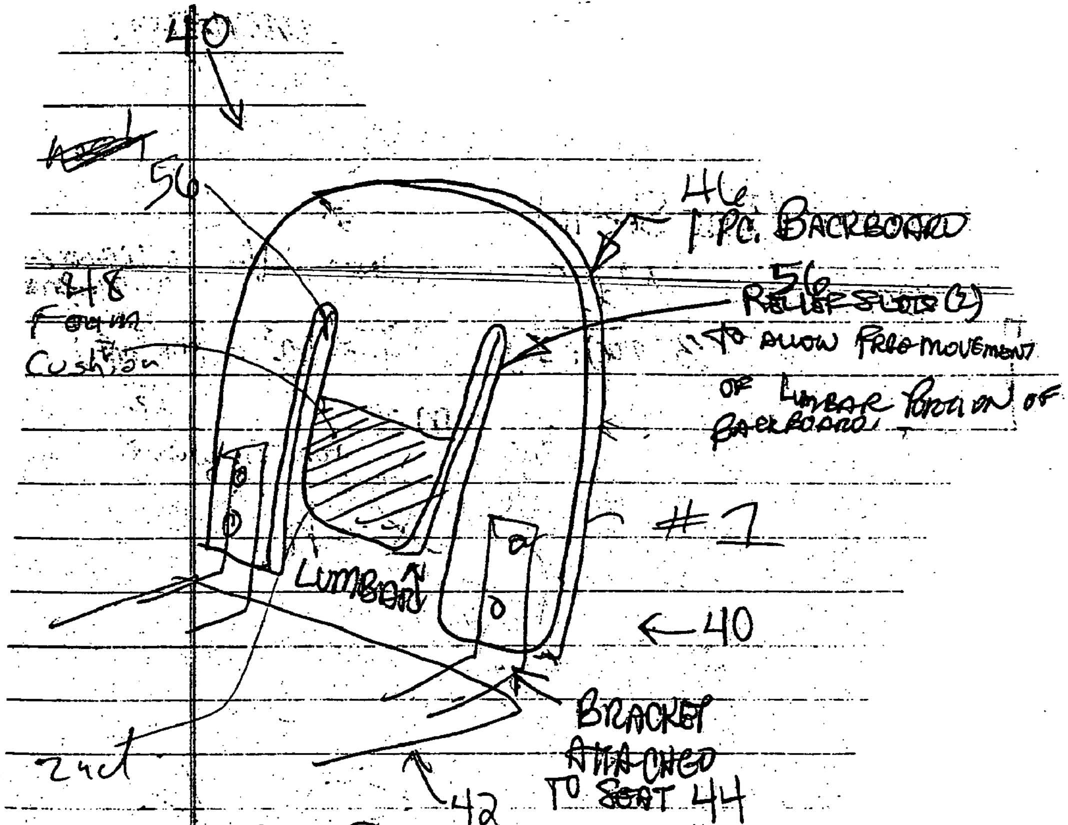

40
56
46
1 PC. BACKBOARD
56
RELIEF SLOTS (2)
TO ALLOW FREE MOVEMENT OF LUMBAR PORTION OF BACKBOARD
48
Foam Cushion
LUMBAR
#1
40
BRACKET ATTACHED TO SEAT 44
2nd
42

FIG. 4

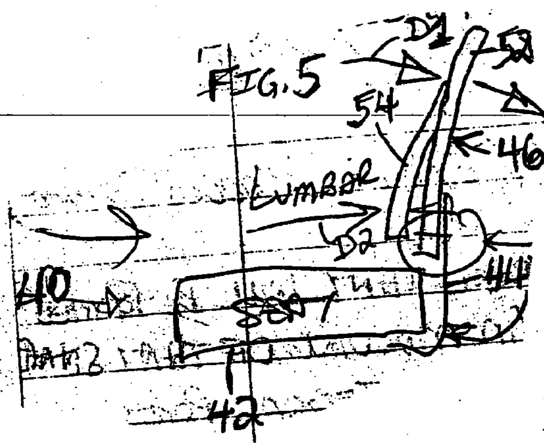


FIG. 5
D1
52
54
46
LUMBAR
D2
40
SEAT
44
42

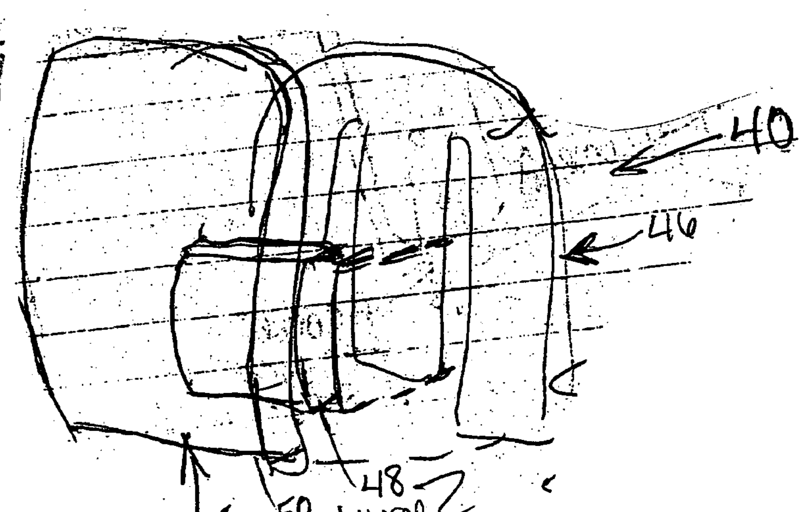

40
46
48
LUMBAR FOAM
2
50
MAIN FOAM

FIG 6

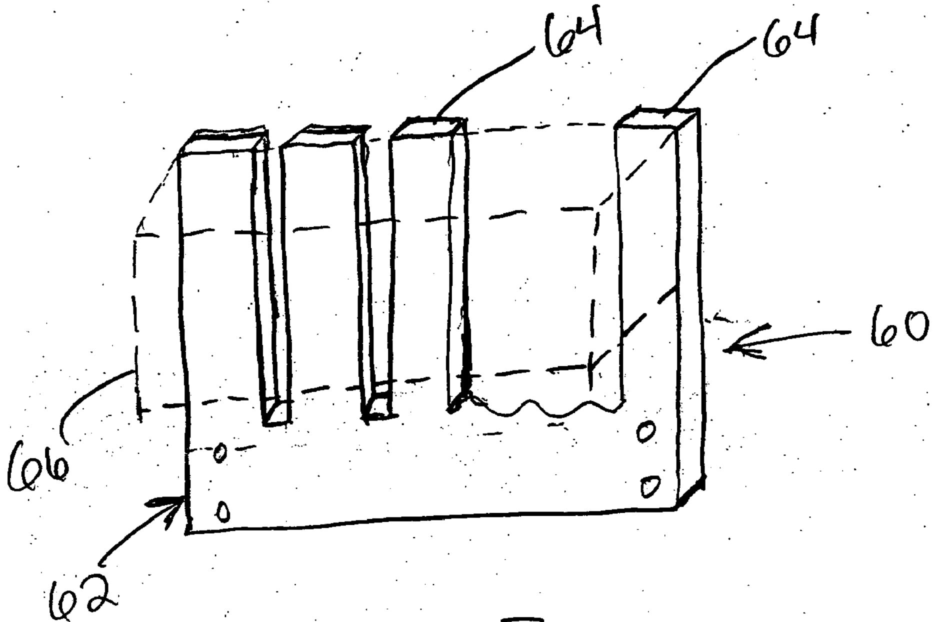


FIG. 7

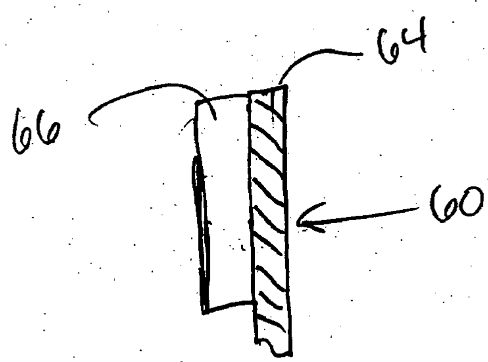
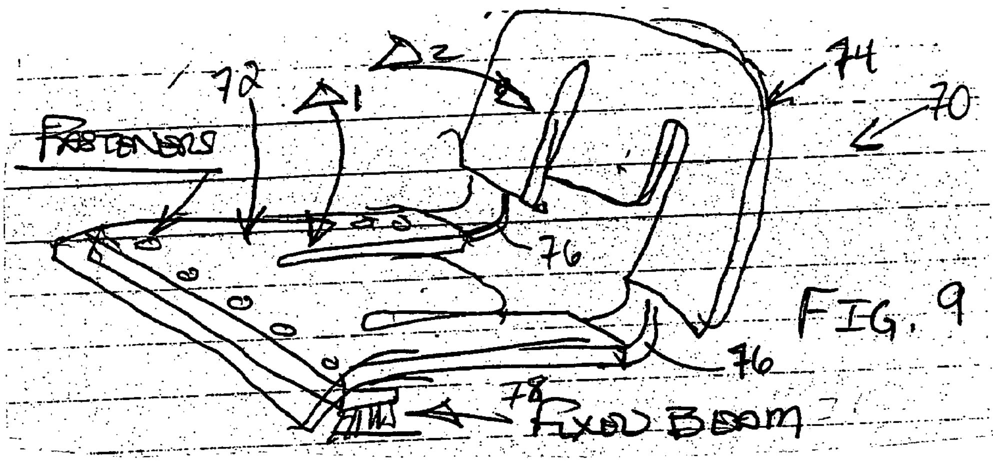
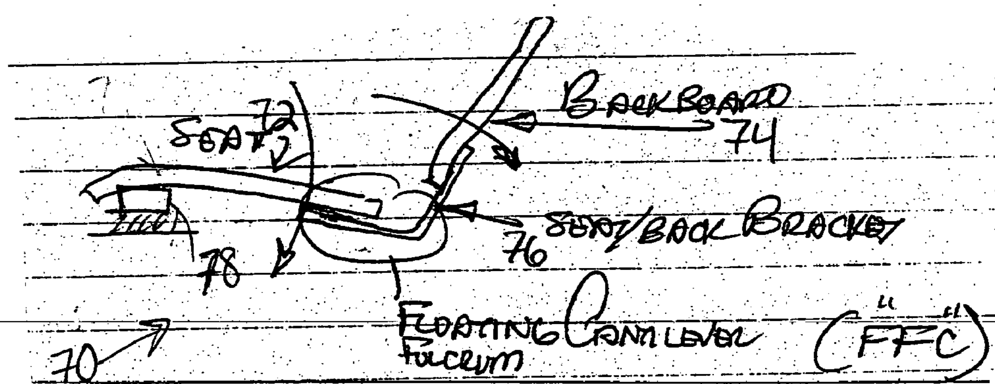


FIG. 8



FASTENERS
72
Δ1
Δ2
74
70
76
76
78
FIXED BEAM

FIG. 9



SEAT
72
BACKBOARD
74
SEAT/BACK BRACKET
76
78
FLOATING CANTILEVER FULCRUM
("FFC")
70

FIG. 10